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ABSTRACT

This report presents an initial approach developed by the General Services Administration for the management of end user computing in federal government agencies. Defined as technology used directly by individuals in need of information products, end user computing represents a new field encompassing such technologies as word processing, personal computers, micrographics, and local networks involving both stand-alone and integrated uses by different classes of users. Descriptions of the components of end user computing and the role of personal computers are provided, followed by discussions of the differences between the new technology and traditional systems, strengths and weaknesses of personal computers, and future problems. A summary of anticipated role changes for executive, oversight, functional, technical, and information resources managers is presented. Management differences as a result of end user technologies are discussed along with the need for a managed environment, new management approaches, managed resources, options available for controlling resources, and development of standards and restrictions. Actions to be taken by the General Services Administration in its government-wide leadership role are also discussed. Guidelines for federal agencies and recommended actions for consideration by agencies are suggested. The latter include policy establishment, strategic planning, agency-wide data rule development, needs assessment and establishment of compatibility standards, evaluation programs, review and approval processes, justification procedures, and support structures. (MBR)

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U.S. General Services Administration
Washington, DC

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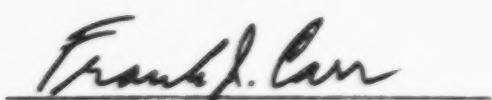

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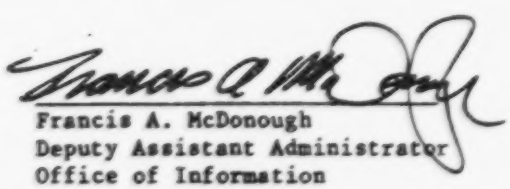

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End User Computing : The Problem and a Proposed Approach

End user computing encompasses a broad definition of technology used directly by individuals in need of information products. It consists of office automation, personal computing, and several supporting technologies which hold great potential for improving productivity in the Federal Government. For example, the General Accounting Office (GAO) estimated the cost of the government work force as $81 billion in 1980 and, on that basis, calculated a potential saving of over $12 billion (15 percent) solely through the introduction of office automation technologies.

The major problem facing government managers is that end user computing technologies are evolving at great speed. New products with great potential are being acquired by many agencies before appropriate government policies can be developed for managing these technologies. Although the personal computer era had been anticipated for years, most managers were unprepared for the rapid introduction of these devices during the past year. At the present time, the technology is in advance of our ability to adequately manage and use it.

The manner in which the government manages office automation technologies will evolve gradually. Appropriate management policy and procedures will develop as the technology emerges and as all managers gain experience with the new opportunities. However, management action is currently required if future problems are to be avoided in the Federal Government. To meet this need, an initial approach for managing end user computing has been developed.

Within the General Services Administration (GSA), we refer to this program as the "Managed Innovation Program," a transitional program designed to meet the needs of the government until we become aware of the full implications of end user computing technologies. The purpose of this paper is to describe the program and to suggest a series of actions agency managers should consider to provide direction to end user computing.

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The Federal Community and End User Computing

End user computing is an inclusive term adopted to describe a variety of technologies, uses, and users. While personal computers are only one of several end user technologies, they have a premier role. If we can learn to manage personal computers, we will be well advanced toward managing the other technologies in end user computing.

Although word processing and commercial time-sharing services have been used heavily by government agencies in recent years, current predictions are for the use of personal computers to become a major growth industry. Most government managers are excited about the potential they offer for improving productivity, but some are concerned about the potential for waste.

Inevitably, discussion concerning the need for a moratorium on the acquisition of personal computers will surface, just as it did with the advent of word processors and large computers.

A moratorium would be unnecessary in most government organizations; however, selective management actions are needed to capitalize on new challenges and opportunities.

Components of End User Computing

There are three components in end user computing. These are technologies, users, and the mode in which the technology is used.

Early in 1982, GSA began to develop a government-wide policy for managing personal computers. Reviews of research done by the Department of Defense and other sources indicated that most organizations in private industry were uncertain about the best way to manage the new technology. No generally accepted management model was available for evaluation by the government. Since personal computers are only one option for meeting user needs, they cannot be managed in isolation. In some cases, personal computers are linked with networks and other technologies to meet the needs of users. These relationships must be considered when developing technical and management strategies.

As a result of these conclusions, GSA recognized that personal computers had to be considered within the broader context of information resources management programs in federal agencies. Personal computers must be evaluated in terms of whether they are used by clerical, administrative, professional, or scientific personnel. In addition, they must be categorized in terms of stand-alone or integrated usage.

Discrimination between the types of users and uses is important when developing a management program. Management should focus more attention on complicated systems with integrated technology used by the untrained clerical personnel. Less attention is required for stand-alone systems used by highly trained scientists.

Consequently, end user computing was adopted as a term used to describe a variety of technologies, users, and uses. Table 1 (see p. 2) summarizes the components of end user computing.

Personal Computers Have a Unique Role

In the sphere of office automation technologies the focal point is currently on word processing and personal computers. These categories of automation are more visible and comprehensible than, for example, a telecommunications network. Perhaps this public recognition and

TABLE 1

COMPONENTS OF END USER COMPUTING

Mode	Technologies	Users
Stand-alone	Word Processing	Clericals
Integrated	Optical Character Recognition	Office Professionals
	Electronic Mail	Scientists
	Micrographics	
	Facsimile	
	Personal Computers	
	Dictation Systems	
	Terminals and Networks	
	Document Storage/ Retrieval	
	Graphics	
	Distribution Data Processing	

understanding is attributable to the considerable publicity they have recently been accorded by the media. Most government employees have at least a layman's acquaintance with word processing and personal computers.

More importantly, these types of devices can be used directly by the end user. While other end user technologies will remain remote or foreign to many government employees, most may be directly using word processors and personal computers by the end of the decade.

In addition, manufacturers are adding a variety of functions to their equipment. Word processors are becoming general purpose, personal computers. Simultaneously, most personal computers are attaining word processing capabilities. As a result, word processing is regarded in this paper as a function performed by the personal computer class of equipment.

In view of the premier role of personal computers among office automation technologies in the future, a special opportunity exists. For example, if government managers can begin to understand and manage personal computers, we will be well on our way to managing various office technologies which support and augment personal computers.

In this paper, therefore, a great deal of emphasis is placed on personal computers even though they are but one piece of the total end user puzzle.

Significant Growth Is Predicted

On September 20, 1982, Time Magazine predicted that the number of personal computers in the United States would grow to 3.5 million in 1983, a tremendous increase over the computers existing in 1980. Since the government traditionally has 6 percent of all computing resources, the government may have 210,000 personal

computers by the end of 1983. The growth curve is expected to continue through this decade. Time points out in its January 3, 1983, issue that computer salesmen have potential consumers in the 83 million U.S. homes with television sets and in 54 million small businesses. According to Time, estimates indicate that 80 million personal computers could be in use by the end of this century. If these forecasts prove accurate and if the Government continues to account for 6 percent of all computing resources, the government could have several million devices by the year 2000.

Word processing and time-sharing services represent dimensions in the growth of end user computing. At the present time there are an estimated 82,000 word processors in the government. Manufacturers are incorporating new and varied functions in word processing equipment and it becomes increasingly difficult to distinguish between word processors and personal computers and vice versa. In the near future, many installed terminals will also have word processing and personal computer capabilities. The government's use of time-sharing services has been stimulated by GSA's Time Sharing Services Program (TSP). Under this program, end users have direct access to commercial computing facilities through specially designed and easily applicable software. This end user initiative became a $154 million program in 1982.

Some Government Managers Are Concerned

Personal computers raise many new issues. They threaten to undermine the monopoly on information systems resources that central ADP organizations have held for 20 years, with the result that some end user managers will be forced to make technology decisions that are currently within the jurisdiction of these central groups. In addition to falling below all approved budgetary thresholds, personal computers raise questions about whether traditional policies, processes, and regulations are suitable for this emerging technology. Finally, end user computing is primarily a decentralized technology which evokes considerable concern over incompatible and nonstandard equipment, software, and systems. The problem is compounded by the prospect that several technologies may require integration in the future.

Is a Moratorium Needed?

In an ideal world, the implications of these new issues would be known. A workable plan to take care of all contingencies would exist. Data requirements at all organizational levels would be apparent. Proper data base design and administration practices would be established. Networks to meet known requirements for the next decade would be planned. A first-rate strategy for managing end user technologies would evolve. In summation, we would progress toward the "office of the future" and other goals. But these ideal conditions do not exist either in the Federal Government or in the private sector.

Should a moratorium be instituted on new acquisitions until all aspects of the emerging technologies are understood? GSA does not support a freeze. Throughout the government we need to proceed with the knowledge at our disposal, however imperfect and whatever its limitations. We need to proceed and profit from our mistakes as the basis for better management decisions later. Most importantly, it should be recognized that our present investments are minor compared to the prospective expenditures in the future. Current expenditures must be viewed as part of the learning process.

Does this approach mean that we should be totally without controls until we learn? GSA does not believe so, but we have responsibility to respond to a new challenge in its embryo stage. Some time is required to appreciate the needs and opportunities represented by this new technology. Within the Federal Government, we must achieve an effective balance between user enthusiasm on the one hand and inappropriate acquisition and use on the other hand. By providing a learning environment in which understanding and growth occur at an appropriate pace, each organization will devise ways to apply this technology and adapt to the unlimited potential of end user computing.

Chapter I.
Technology of End User Computing

Because of extensive coverage in the media, most Americans are aware of personal computers and that millions of units will be sold in the years ahead. But aside from the equipment, what is new and different about this technology? What are the strengths and weaknesses of end user computing compared to the traditional methods of developing systems on large computers? Do problems lie ahead? These questions are discussed in the following sections.

Traditional Systems Versus Personal Computing

In the history of computers, most applications systems have been developed by a central ADP group. The traditional tools have been formal systems analysis, structured requirement specifications, and integrated systems design. After long periods of systems development, systems were created that met many but not all requirements. The traditional approach has resulted in vast backlogs of needed systems, which can never be developed because of resource limitations and growing opportunities for system automation.

Some of these requirements will be met by end user computers. Large computers and traditional systems development methods will continue to meet many of the needs of functional specialists, but personal computers will provide another option. Functional specialists will meet some of their requirements by creating their own applications and by using the new packaged software being widely developed for personal computers. This approach eliminates the handcrafted programming responsible for some of the delays in traditional systems development. Although packaged software does not provide for every application desired by end users, the inventory is sizable and will expand steadily in the future. At the present time, approximately 21,000 software packages are available to support personal computers.

With the availability of packaged software and small computers, end users will have immediate access to a system operating to meet at least some of their needs. Since end users are in control of their own software and computers, they will find new ways to meet their needs and to improve their productivity. With this flexibility, they will develop their own approaches while learning more about their requirements and the capabilities of their systems.

The Great Strength of Personal Computers

The new technology further reduces the gap between the user of data and the machine. Even software designed for large computers and time-sharing services have made advances in this direction. Personal computers promise bigger and faster advances. With their knowledge of job requirements combined with their fingertip control over software and the computer, end users will gradually evolve their procedures as their needs are perceived. As a result, end users attain a flexibility that permits them to adapt to changing circumstances. In addition, administrative procedures evolve a step at a time, with each step being a reaction to current problems and pressures. Computerized systems evolve in the same manner to perform complex procedures. The inability to adapt readily to change has always been one of the great weaknesses of the traditional approach to systems development. Where personal computers are appropriate, they permit this adaptability. Therein lies their great strength of personal computers.

TABLE 2

COMPARISON OF TRADITIONAL AND END USER APPROACHES

Problems with Traditional Development	Attractiveness of End User Development
Long system development backlogs	Users do their own thing and bypass the system development backlogs in the central ADP department
Little end user involvement	Direct end user involvement
Formal specifications are time-consuming	Formal specifications are usually not written. Emphasis is on buying software already written to perform pre-defined functions
Documentation takes substantial time	Programs are self-documenting
Definition of requirements is difficult because users do not know what they want until they see it	End users often work out requirements as the system develops. This leads to early products.
Impact of change is severe	Impact of change is minimized
Permanent maintenance burden is created	Systems are easier and less expensive to maintain
Application programs require extensive development	Applicable software often can be purchased and implemented by the end user

Comparison of Traditional and End User Approaches

Personal computing can also be called end user development because of the direct interaction between the user, the data, and the computer. The problems resulting from traditional systems development can sometimes be solved by end user computing. As a result, there is a great deal of early enthusiasm for the new approach. The reasons are summarized above in Table 2.

Does this mean that personal computers with their end user emphasis will replace traditional systems development techniques? The answer is no. There will be a role for the traditional approach in complex, high production, transaction-oriented systems, such as payroll, accounting, personnel, and inventory control. But the personal computer approach will also have a role, perhaps eventually a dominant one.

Functions End Users Can Perform for Themselves

When we talk about users doing things for themselves, what functions are we talking about? What can users do for themselves? What functions are currently supported by packaged software?

There are four general levels of sophistication in personal computing.

Level 1 -- Generating graphics displays, developing new reports, updating data bases, and originating spread sheet analyses.

Level 2 -- Interfacing with electronic mail systems, using the computer as a calculator, retrieving information, and making inquiries into a data base by using prearranged inquiry routines.

Level 3 -- Developing new applications by using packaged software. Combining outputs from Levels 1 and 2 into a decision support system.

Level 4 -- Developing new applications systems by using a higher-level language, such as a data base management system.

It should be noted that the vast majority of end user computing is occuring at levels 1 and 2.

The most widely used software at present is spread sheet analysis software, which is particularly oriented to budget and planning analyses. In addition, word processing and data base management software are being widely used at the present.

Potential Problems

Indiscriminate use of end user technologies can cause several problems. Waste represents the foremost dilemma. In earlier years, waste was observed in the use of large computers, time-sharing services, and word processors. As these technologies evolved and as Federal agencies developed more sophistication in managing the new tools, waste was minimized. Waste can occur in several ways during the early use of personal computers. Inexperienced managers may make poor acquisition and usage decisions. Some personnel may devote an inordinate amount of time to the computer and neglect the performance of their principal job responsibilities.

In addition, some managers are concerned that equipment justified for stand-alone use will eventually need to be integrated into a network and that it will be difficult to achieve this integration at a later date. An agency's data may become fragmented as a consequence of its inclusion in incompatible computers and software packages. There is also concern that important government decisions will be based on unaudited data. Finally, many systems will not be documented and will exist solely as the brainchild of the job incumbent. With a large employee turnover, it could be difficult to manage and maintain a system which has become critical to the organization.

Chapter II.
Emerging Management Role Changes

At this early stage, it becomes increasely apparent that end user computing will cause changes in the roles of managers at all levels. A summary of the anticipated role changes for executive, oversight, functional, technical and information resources managers is outlined as follows:

Executive Managers

In the Federal Government, executive managers are at the political appointee level, typically at the assistant secretary for management (or administration) position. With respect to the future of office automation technologies, these managers are the most influential and pivotal officials in government agencies. More than other authorities they can constrain, force, or remain in a neutral role regarding the use of the technologies.

Unfortunately, three existing problems limit the effectiveness of executive managers in this area. First, their length of service often extends between 18 to 24 months, with the result that they favor quick fixes and short term payoffs. Second, their insight and experience in managing technology is often limited. Many of these officials have backgrounds in financial management which are of marginal value in providing leadership for technology functions. Third, executive managers have difficulty in obtaining competent advice in this area, partly because the field is so new that proven consultants are rare.

Within their respective agencies, executive managers need to create the proper environment for end user computing, an atmosphere which is neither forcing nor constraining. Technology, particularly personal computers, should flow normally into the government. Functional managers in personnel, budgeting, law enforcement, defense analysis, etc., should be given the flexibility to spend some operating funds to meet their needs. Executive managers also need to ensure that assistance is provided to functional managers making technical decisions for the first time, otherwise referred to as "establishing the necessary support structure" in this paper.

Finally, executive managers need to ensure that the process contains some built-in checks and balances, in order to guarantee that all technologies assume their proper roles in an agency. Providing the proper support structure will ensure the effective and efficient use of personal computers. However, personal computing is simply one aspect of a broad information resources management program. Traditional ADP, telecommunications, and records management functions, such as forms design, copy and mail management, etc., all need to be considered within an integrated program.

Oversight Managers

Oversight managers are staff personnel in information resources management technology. They establish policy, prepare directives, issue guidelines, review and approve plans developed by line managers, and in some cases, participate in audit or review activities in information resources management.

Oversight managers are facing a role change. Current oversight policies in the government were developed for large, central computing facilities and systems. Typically, a small number of cases that involve multi-million dollar plans are subject to reviews. Intensive reviews of these line management plans are often

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conducted by oversight officials. Personal computing, however, concerns facilities and systems on a smaller scale. These cases often involve small dollar plans which are not within the purview of oversight officials.

Another problem for oversight officials is that government policy typically lags behind advancing technology. This is the problem with personal computers. The technology has developed rapidly during the past few years, yet existing oversight policies in federal agencies are still oriented toward controlling big, central facilities.

As the number of government employees using personal computers and other office technologies increases, there will be a need to simplify processes, procedures, and guidelines. These revisions will be needed to permit a larger percentage of the federal community to acquire, use, and manage the new wave of technology.

The future role for oversight officials suggests a strategic approach rather than an equipment transaction orientation. The focus must be on data uses, security, new and simplified tools to handle volume transactions, leadership through incentives, and service in areas where dollar commitments are low. Most oversight officials, however, are control-oriented and versed in large central facilities and systems. For this reason, they will need assistance to make the transition to this future role.

Functional Managers

Functional mangers are the actual end users. They comprise the personnel managers, comptrollers, tax policy analysts, tax auditors, customs inspectors, and other line managers in the Federal Government. Functional managers have traditionally obtained technical guidance from central ADP, telecommunications, and records management staffs. They have been frustrated by the backlogs in systems development, but they are beginning to make their own decisions concerning the procurement of equipment and software. They are also making their own decisions in organizing and developing the systems they need to manage their responsibilities. But there are related problems.

Functional managers are currently overwhelmed with information on office technologies, particularly personal computers. The maze of regulations may appear overwhelming. While attempting to procure and use personal computers to improve productivity, the managers may be intensively scrutinized by information resources management officials, oversight officials, the General Accounting Office, and inspectors general staffs. In addition, the managers are being forced to make priority decisions relating to equipment, software, and application that were formerly made by the central ADP staff. Functional managers also do not possess a sufficient knowledge of procurement rules, computer equipment, or software and cannot assess the risks or potential payoffs when committing resources to an office technology project. They have a difficult role and need assistance, perhaps more so than the other types of managers discussed in this paper.

Technical Managers

Technical managers are often the senior ADP managers in federal agencies. For 20 years, technical managers have controlled most of the resources and decisions relating to the allocation of information systems resources. They have developed the fundamental systems in the government, with the result that much progress has been made in streamlining operations and administration. During the past 20 years, civilian employment has remained constant and the work force has shifted from clerical to professional employees. Technical managers have played an important role in creating the environment to make this transition possible

Technology and legislation are changing the traditional role of technical

managers. Although central control has often been a basic tenet of technical managers, personal computing is based on a decentralized technology in which some decisions are made by functional end users rather than centralists. Some managers feel that "bigger is better" and tend to downplay the capabilities of small, low-cost computers. They are often buried in the day-to-day details of maintaining the central systems used to manage their agencies.

Technical managers observe that functional managers buy equipment and software without their concurrence. They suspect that these same functional managers will eventually consider linking their end user computers and software with the central systems. However, the proper interfaces may not exist because the technical manager was not involved during the initial procurement.

It remains to be seen whether end user computing will expand or contract the role of the technical manager. On the one hand, the role could contract because many end users will be able to function without technical assistance. On the other hand, the role could expand as the overall volume of systems and data grows and as end users' understanding of computers increases in the years ahead.

Technical managers may not have the opportunity to control all personal computers. Traditional control in this high volume, low-cost world seems out of the question. For stand-alone users of technology, service and an emphasis on performance incentives will be key factors in the future. It appears however, that technical managers will continue to exercise control over complex, integrated end user technology.

Technical managers need additional skills. In addition to their proficiency in managing large systems, they need to develop (1) a knowledge of the range of functions inherent in information resources management, and (2) a service/incentive orientation in the area of high volume, end user computing.

Information Resources Managers (IRM)

End user computing is one IRM function. Like all large, data-conscious organizations, federal agencies are facing the challenge of change. The opportunities for exploiting new information technology are outstripping the capacity of many organizations to implement new methods and procedures. The problem is one of management, not technology.

Emerging from this situation is the concept that information does not constitute a "free good." Data and information should be managed in the same way as other resources, such as people, money, facilities, and supplies. By considering information as a resource, it serves as a unifying concept for managing all resources involving the creation, handling, storage, retrieval, and distribution of information.

This concept of "information resources management" provides the focus for solving a dual management problem. The question is how to satisfy the information needs of an organization at an acceptable cost level while simultaneously exploiting new technology. In the Federal Government, information resources management has been embodied in Public Law 96-511, the Paperwork Reduction Act of 1980. It defines management responsibility and accountability for all information resources, including ADP, telecommunications, and all records management functions.

The Paperwork Reduction Act of 1980 represents a major revision of the traditional manner in which the Federal Government has managed information technology and information as a resource. Although it is too early to assess the long-range effects of the Act, it nevertheless recognizes the vital confluence of information management and technology in public administration.

The "invisible person" in this scenario is the IRM executive, his identity is not certain. Information resources management is not the expansion

of any single domain, such as ADP, telecommunications, or records management, but rather implies a management concept embracing and integrating all of these disciplines. An individual's capacity to manage a particular discipline will not assure selection as the IRM executive. In addition to one's own discipline, an understanding of the other disciplines and their particular management problems will determine who provides leadership in information resources management. Clearly, however, IRM managers will integrate end user computing with other solutions available to meet user needs.

In summary, management role problems are currently emerging as a result of end user technologies and particularly personal computers. New and integrated approaches with respect to traditional ADP, telecommunications, and records management functions must be developed and implemented. Executive managers, oversight officials, functional and technical managers are experiencing role changes because of these new technologies. They are preoccupied with other problems unrelated to end user functions. A need exists to develop a program to help management incumbents at all levels to perform the responsibilities that the emerging technology is forcing upon them. Such a program, entitled "A Managed Innovation Program" is proposed later in this paper. It outlines a series of planned actions by GSA and recommended actions for line agencies.

Chapter III
Managing End User Computing

At the present time, the Federal Government manages all information systems and their technology with processes developed over the past 15 years. End user technologies, particularly personal computers, need to be managed somewhat differently than large, complex, and costly ADP systems.

Need for a Managed Environment

Microelectronic and packaged software are permitting many end users to develop all, or part of, their applications. This development must be done in a managed environment for several reasons:

. To ensure that data entered or maintained by end users is employed to its full potential.

. To ensure that data is compatible, as necessary, both vertically and horizontally in the organization.

. To ensure that adequate accuracy controls on data are used.

. To avoid integrity problems caused by multiple updating of data.

. To ensure that the benefits received are commensurate with the investment in equipment and software.

. To ensure that the systems built are auditable and secure, where necessary.

. To assist the users in developing software applications as efficiently as possible, and to share those already developed.

Notice that the emphasis on the first four items is on data. This focus on data administration is one of the most interesting aspects of end user computing. It marks the beginning of a new focus on data administration in a way that central ADP rarely emphasized.

New Approaches are Needed

. At first, there were initial attempts to manage office systems technology, particularly personal computers, with existing processes. Other approaches are needed for several reasons.

. Case-by-case review of equipment justifications is impracticable. The large volume of personal computers entering the government during the next decade totally precludes case-by-case review of equipment requests. Yet the government has used this process when systems and equipment were needed during the past 15 years.

. The large number of devices that will enter the government will also render impracticable the traditional procurement approach to meeting the needs of one system. Instead, a vehicle is needed to treat the procurement of a large number of small computers as a single acquisition. In recent years, government managers have developed some expertise in acquiring a large number of word processors in a single acquisition. This experience will be helpful in acquiring personal computers.

. In the instance of personal computers, the traditional approach of developing detailed systems requirement specifications and releasing them to vendors for bids and benchmark tests is impossible. Vendors are not in a position to submit bids on a system-by-system basis (unless the volume is high). Nor are they in a position to undergo benchmark tests. On the requirements

side, compared to a $2,000 investment for equipment and software, developing detailed specifications is too costly.

. Finally, equipment manufacturers do not always provide the desired software. In fact, one may obtain software from one vendor and then select a machine from another vendor to run the software. New procurement vehicles are also needed for low-cost software.

In summary, it is not practical to justify and procure low-cost technology, such as personal computers, in the same way as large costly systems. Personal computers are creating different problems that require new approaches. Some old processes will need to be revised and some new approaches will need to be devised.

Current Status in Government

The current environment in government might be termed one of "concerned laissez-faireism." This environment is neither forcing nor constraining. This is true of central and line agencies and it is appropriate in these early days of end user computing.

There is concern that problems are developing that agencies will need to face in the future. However, few managers are pushing for a moratorium until the whole process and scenario can be thought through.

Knowledge of end user computers is limited in the government. The exceptions are seen in individuals who have spent their own money and time to learn a little about end user technologies.

Resources That Can Be Managed

Management means focusing attention on resources. What are the resources that can be managed? In what ways can they be managed? There are six resources that can be managed. Management can control one or all of these in several different ways. These resources are listed below.

. Information - This resource includes the hierarchy of information needed to manage at Departmental and Central Office levels. It includes regional and local information needed by managers at these levels. It includes all data, whether internally generated or procured from one of the newer suppliers. Controls can be set at any level to preclude end users from working with specified information.

. Personnel - This resource includes the entire class of end users who will begin to use technology of any type for the first time. It includes traditional ADP personnel who need to know the capabilities of the new technology. It also includes various managers, such as executives and such as oversight, functional, and technical managers, who have vital roles and need more knowledge to meet their changing responsibilities. A variety of controls and incentives can be applied to the various people who use or influence the use of the technology.

. Telecommunications - This technology may become more important than the new personal computers. Telecommunications will be the link that binds together end user computers and permits them to communicate with each other and to larger central computers. Telecommunications standards can be established to permit transfer of data between different computers in the government.

. Application-Systems - The resource most in need of control is the application system developed to assist functional users in managing an agency. One example is spread sheet analysis that will be used increasingly by budget and program analysts. Management could control the usage of technology by indicating that certain systems or data are "corporate reserved."

. Hardware - This resource includes the range of equipment available to the government. At the present time, there are over 200 personal computer manufacturers and at least another 200 manufacturers of word processing equipment.

Management could standardize on certain equipment or operating systems while following procurement regulations.

. Software - This resource includes the range of personal computer software available to end users. At present, there are more than 21,000 software packages being marketed to end users. Management could attempt to standardize on certain software packages for use in an agency.

Management Options for Controlling Resources

Management can control resources in several ways. Controls can force or constrain the program. The end result depends on management's motivation. Some options are more realistic than others. The options available to management are as follows:

. Standards - Management could specify standards for certain resources. For example:

a. An approved list of equipment and software products could be developed for use in an organization.

b. Any procured equipment could be required to meet specific standards and communications protocols, in order to provide linkage with the agency's data network.

c. Under an approved hierarchy of agency data, certain data could become the province of the central office and, therefore, would not be acquired or used at regional or local levels.

. Restrictions - The use of certain resources can be channeled by restrictions. For example:

a. Some technologies could be restricted to managers or any other class of employees.

b. Approval authorities could be limited to a specific executive or to a specific contracting officer.

c. Handcrafted programming could be prohibited. Although it would be difficult to control.

Other Actions Available to Management

Standards and restrictions are figuratively the "sticks" which can be used to direct the program. In addition, a series of "carrots" are available to management. The "carrots" approach consists of:

. Guidelines - Management could require that a series of guidelines be developed. These guidelines would provide end users with advice and counsel to ensure the efficient and effective use of time and money. These guidelines could include:

a. How and where to buy information.

b. Advice on suitable and unsuitable uses of technology.

c. Advice on adequately priced, quality equipment and software to meet specific needs.

d. Advantages of local data networks and how end users can plan for the services of these facilities even as they become more sophisticated.

. New Procurement Vehicles - Large numbers of personal computers will enter the Federal Government during this decade. Management wants to ensure that they are procured in a cost-effective manner. Purchasing these computers in small lots would be expensive in terms of contracting officer time and lost volume discounts. The procedure would also aggravate the incompatibility problem. To ensure cost-effective acquisitions, management should institute new procurement vehicles to obtain large numbers of small computers

quickly and at favorable discounts. Models of these vehicles already exist because most agencies have made aggregate purchases of word processing equipment since the mid-1970's. In addition, newprocurement vehicles are needed to acquire large numbers of popular software. Current examples include Wordstar, Visicalc and dBase II.

. Support Structures - Management can establish organizations to help prospective end users understand the new technologies and make good procedural and procurement decisions. While leaving the ultimate decisions to end users, support structure personnel can channel them in specific directions and have a significant impact on the end user program.

. Education Tools - End users and managers at all levels need training in personal computers and in other office automation technologies. Management could plan and implement agency-wide training programs to develop computer literacy. These programs would be appropriate as perhaps one out of every two employees begins to use the new technologies.

Other education tools might include a buyer's guide for personal computers and packaged software. A software clearinghouse could recommend a source to help end users identify solutions developed elsewhere.

Table 3 (below) summarizes the resources associated with end user computing and identifies so-called "carrots" and "sticks" available as potential management controls.

Table 4 (p. 17) indicates whether we currently possess sufficient knowledge to pursue each option.

Blocks that are blank indicate that the option versus resource relationship is viewed as marginal or relatively unimportant at the present time.

TABLE 3

OPTIONS FOR MANAGING END USER COMPUTING

Resource	Controls
Information	Sticks
Personnel	Standards
Telecommunications	Restrictions
User functions (application)	Carrots
Hardware	New procurement vehicles
Software	Support structures
	Education tools
	Training Plan
	Buyer's Guide
	Clearinghouse

TABLE 4

SUMMARY OF OPTIONS FOR MANAGING EUCOM RESOURCES

Option	Information	Personnel	Telecommunications	Use Functions	Hardware	Software
Sticks						
Standards	No	No	Yes	No	No	No
Restrictions	No	No	Yes	No	No	No
Carrots						
New Procurement						
Vehicles	No	---	---	---	Yes	Yes
Support Structures	---	---	Yes	Yes	Yes	Yes
Educational Tools						
Training Plan	---	Yes	---	---	---	---
Buyer's Guide	---	---	---	---	Yes	Yes
Clearinghouse	---	---	---	Yes	Yes	Yes

Table 4 indicates that, with the exception of telecommunications, not enough is presently known to establish standards or restrictions over any of the six resources. In telecommunications, certain data and protocol standards and restrictions could be established today, with the result that problems with incompatible equipment and software would be precluded in the future.

Nevertheless, progress can be made in other areas as well. Enough is known to permit the creation of new procurement vehicles and a Buyer's Guide to facilitate the acquisition of certain hardware and software in large numbers. Similarly, we can currently envision the need for support structures to help functional personnel acquire and use the new technology.

It is also evident that training in the development of computer literacy is needed at the executive, oversight, functional, and technical levels of management and at the end user level as well. These represent areas in which a series of specific actions can be identified and implemented in these early days.

It is apparent on the basis of the preceding sections that our knowledge varies about what management actions to implement. Potential government-wide management actions fall into three categories: (1) areas in which the need for action is obvious; (2) areas in which the needed action becomes visible after a few well-conceived pilot projects; and (3) areas in which the needed action is more elusive and which may require further technological innovation. In the latter case, attempts to establish a restrictive government-wide policy would be premature and retard the productive use of the technology. As indicated earlier, there will be stand-alone and integrated uses of office automation technologies. The former are easier to conceptualize but need less control. The latter need more central control and it is difficult to determine the proper controls without creating unnecessary restrictions at this early date.

In addition, personal computers, including word processing, have a premier role in all end user technologies. They involve the end user directly in the processing of data. If we begin to manage personal computers, we will be in a pivotal position to manage other office automation technologies.

Chapter IV.
GSA's Government-Wide Initiatives

A government-wide program is underway to provide transitional leadership until more is known about the potential overall impact of end user technologies. This program is called the "Managed Innovation Program." Under this program and in this chapter, a series of actions to be taken by GSA in its government-wide leadership role are discussed. In the next chapter, a series of guidelines for federal agencies are described.

Two types of actions are planned by GSA. One type concerns direct management initiatives in cases where the problem is understood well enough that government-wide action can be taken. The other type involves areas in which our understanding of the need is limited. In these cases, pilot projects are planned to provide the necessary insight.

Develop a Fact Finding Facility

Personal computing is a new and fast paced area. For this reason, data will be needed on what functional managers are doing with personal computers, problems they are encountering, and areas in which future controls or assistance are needed. Normal methods of data collection for the purpose of government-wide oversight will not be adequate. Many end user decisions will be decentralized and made by thousands of functional managers.

In an effort to contact these managers, a special personal computing fact-finding facility is planned. This will provide GSA with data needed to develop government-wide policies as the field emerges.

Develop a Local Data Network Policy

Telecommunications offers greater potential in solving certain incompatibility problems than any other end user technology. Local data networks could be established in each agency. Their protocols could then be made mandatory requirements when end user devices are procured. It will then simplify our task when stand-alone devices evolve to more sophisticated usage and need network access to a central host computer.

In view of the fundamental importance of telecommunications, it is planned to develop an FPMR bulletin outlining our emerging policy and recommended agency actions with regard to local data networks.

Revise Regulations and Guidelines

A bulletin will be developed to orient the justification processes for end user technology, including word processing, to the basic GSA philosophy of meeting user requirements at the lowest overall cost. This bulletin will emphasize that current justifications based on key strokes and machine use apply only to pure text editing applications in a pooled environment. The new bulletin will also indicate that the misapplication of this type of justification beyond pooled word processing to other types of end user equipment, such as personal computers, is diverting management attention from the basic objective of saving money, improving productivity, and meeting the mission requirements of the agency.

As the market evolves, it becomes apparent that all small computers, including word processors, are multi-purpose devices. While some of these devices are marketed primarily as word processors, they are computers programmed to deal specifically with text creation and editing functions. Many can perform

other data processing and computational functions as well. To solve this problem and to clear the air, the procurement and management regulations governing ADPE and word processing equipment will be revised (and combined) so that all end user technologies, including word processing equipment, will be treated in the same manner.

In addition, we concur with the General Accounting Office's (GAO) appraisal concerning the need for management guidelines in this area. As a result, criteria will be developed on planning, developing, managing, and evaluating end user computing technologies. Following the GAO recommendation, emphasis will be placed initially on office automation systems.

Develop a Buyer's Guide for Personal Computers

At the present time, there are more than 200 manufacturers of personal computers and more than 21,000 software packages available for purchase. Not all are of industrial quality. Only a few are known to many retailers. Functional managers are beginning to make equipment and software acquisition decisions related to the new technology. They need guidance in identifying the proper equipment and software. The traditional hand-holding assistance provided by consultants is inadequate. A better method is needed to distribute information concerning equipment and software to the thousands of functional managers in the government.

A buyer's guide will help meet this need. It will contain comparison information on all the small computers and software packages available in the nation. With this information, functional managers will be able to identify sources of equipment and software available to meet current needs.

The guide will also contain an abbreviated version of GSA's acquisition regulations to help inexperienced functional managers meet programmatic needs on the basis of government policy, a topic discussed in the next section.

Develop Condensed Procedures

Functional managers may be overwhelmed by the government's regulations, policies, and guidelines governing information systems acquisition and management. A step-by-step "how to" document is needed to help functional managers meet their needs within the context of the government's rules and policies. GSA will develop and distribute a publication, and possibly audiovisual materials, which will guide functional managers through the various regulations, policies, bulletins, and procurement programs applicable to end user technology, with particular emphasis on personal computers.

Develop Procurement Vehicles for Equipment and Software

Traditionally, the government buys one or two computers at a time. After 18 years, there are now 16,000 general-purpose computers in the government. Projections suggest that more than 210,000 personal computers could be installed in the government by the end of 1983. Clearly, we cannot procure personal computers one or two at a time in the same way that the government procured large computers over the past 18 years.

A vehicle is needed to speed up the acquisition process, to minimize contracting officer time, and to reduce the paperwork that the government imposes on itself and on vendors. A new government vehicle is needed in order to reduce the costs of acquisition and in order to obtain favorable prices for personal computers and supporting software. A precedent exists in the selective acquisitions of tapes and disks, typewriters, and word processors. Likewise, personal computers need to be purchased as commodities and as other high volume items.

One complicating factor is that personal computer users often select needed software before obtaining a machine that will operate with the software. Advance purchases of equipment may be inappropriate for this reason. A second complicating factor is that products become obsolete quickly in today's market. Failures are also predicted for many current manufacturers. Large volume purchases in this volatile market need to be planned with care; the government does not want to procure products that become obsolete overnight.

GSA plans to implement a new approach for the acquisition of personal computers. The objective is to obtain discounts from aggregate purchases on a government-wide basis. In the spring of 1983, GSA will pilot test a schedule similar to the Teleprocessing Services Program (TSP) in which aggregate purchases are arranged with a number of microcomputer vendors and associated software suppliers. Two agencies will be included in the pilot test. In addition a computer store is planned to meet low volume needs beginning in September 1983.

In software, an entirely new marketplace is being developed. With respect to the acquisition of software for personal computers, we plan to convene a small group of selected personnel to help us think through the right approach for the government to follow.

Develop a Nationwide Cluster Maintenance Contract

End user computers are beginning to adopt the market behavior of a commodity in which price is the dominant competitive mechanism. Equipment warranties are typically for 90 days, with extended warranties available at extra cost in some instances.

In areas with significant government employee concentration, it is not yet clear what commercial facilities will materialize for repair and maintenance of end user computers. Nationwide service firms exist with whom equipment maintenance contracts can be negotiated at reasonable prices by the month, or on a per call basis, for clusters over a certain size.

A cluster maintenance contract may be considered to provide timely, reliable, reasonably priced repair wherever local concentrations warrant. The maintenance contractor would submit a single bill to GSA and payments would be made weekly or monthly according to the terms of the contract. In turn, GSA would bill agencies.

Organize Forums for Agency Executives

A one day forum is planned to orient assistant secretaries for management in issues relating to end user computing. These issues include developing computer literacy at all agency levels, organizing for information resources management, establishing support structures, maintaining interpersonal communication between separate technologies, and procuring and managing large numbers of low cost computers.

In addition, following a recent recommendation by the General Accounting Office, GSA will establish a forum for the exchange of information and experiences between agency managers concerned with the full spectrum of end user computing.

Promote a Joint Literacy Plan

Several major technology training organizations serve the government. These outlets include the Computer Institute at the Department of Defense, the Office of Personnel Management, the Graduate School of the Department of Agriculture, and GSA's Training Center. During the 1980's, many of the government's 3.5 million civilian and military personnel, including nearly all its managers, will need to understand personal computers to do their jobs and to compete for other jobs. Learning about computers is called developing computer literacy. This massive training requirement is complicated because too few resources are available on an ad hoc, unplanned basis. We plan to

work with the major technology training centers to consider the development of a government-wide computer literacy program.

Investigate Records Management Questions

Records management as a function has emphasized paper output. Technology is replacing paper as an output medium. As one example, can the contents of floppy disks be considered "records" under the Federal Records Act or are they electronic substitutes for personal notes? If they are records, are they disposable under the General Records Schedules or do they need to be scheduled for disposition?

The National Archives and Records Service and the Office of Information Resources Management will jointly develop a plan to identify these issues and provide answers to records management questions being raised by end user computing.

Develop the Computer Store Concept

Some feel that EUC will be purchased as an off-the-shelf commodity in the near term. Computer stores are appearing in all the nation's cities and these may be the precursor of stores that will sell computers as a commodity.

As the supplier of many of the goods and services in the government, it is appropriate that GSA evaluate the Computer Store concept. Such facilities would be used by agencies in need of small computers and associated software. The current concept is where a government employee would walk in with a need, receive assistance, pay, and walk out with the equipment and software. The Computer Store would be located in government space; but, it would be operated by a firm which already runs retail Computer Stores in the country. The first store will be opened in the GSA central office in September 1983. As more is learned about managing this kind of a facility in government, computer stores may be opened in other government buildings in the country.

Perform an End User Computer Pilot Project

To help meet GSA's internal management and government-wide responsibilities, a personal computer pilot project has been instituted. Under this management program, up to 50 personal computers are being made available for new purposes. GSA employees at any level, in any function, who feel that a personal computer device would improve their own productivity were eligible to apply for the program.

A major program policy provides that oversight will be conducted in a manner commensurate with the relatively low cost of personal computers. Although cost beneficial use remains the basis for any acquisition in the government, a balance must be achieved between the cost of oversight, elaborate justifications, and reviews on the one hand and the cost of procured equipment and software on the other hand. Software packages will also be used whenever possible in lieu of handcrafted programming to minimize personnel costs.

The focus of the program is on applications which can use the more widely available software, such as spread sheet analyses and data base management. A series of progress reviews is planned to ensure that the lessons learned are understood at all levels of management. This project will provide useful insight for agencies interested in both stimulating interest in and managing personal computers. Specifically, it will permit managers to observe and determine the correct and incorrect uses of personal computers, and to gain experience in controlling the justification, approval, oversight, and evaluation of computer activities.

These 12 GSA government-wide initiatives are summarized in Table 5, (p. 23.) Target dates for these initiatives are provided in Table 6, (p. 24.)

TABLE 5

MANAGED INNOVATION PROGRAM
GSA GOVERNMENT-WIDE INITIATIVES

Purpose	Initiative
Policy	Develop a fact-finding facility
	Develop a local data network policy
	Revise regulations and guidelines
Agency Assistance	Develop a buyer's guide for personal computers
	Develop condensed procedures
	Develop procurement vehicles for equipment and software
	Develop a nationwide cluster maintenance contract
Education	Organize forums for agency executives
	Promote a joint literacy plan
In-House Learning	Investigate records management questions
	Develop the computer store concept
	Perform an end user computer pilot project

TABLE 6

TARGET DATES
GSA GOVERNMENT-WIDE INITIATIVES

Initiative	Completion Date
Revise regulations and guidelines	Ongoing through 1984
Perform end user computer pilot project	December 1982 - September 1983
Organize forums for agency executives	Spring and summer, 1983
Develop procurement vehicles for equipment and software	Summer, 1983
Develop a Buyer's Guide for personal computers	Fall, 1983
Develop a fact finding facility	Fall, 1983
Develop the computer store concept	Fall, 1983
Investigate records management questions	Spring, 1984
Develop a local data network policy	Summer, 1984
Develop a nationwide cluster maintenance contract	Fall, 1984
Promote a joint literacy plan	Winter, 1984
Develop condensed procedures	Winter, 1984

Chapter V.
Recommended Agency Initiatives

Many agency executives are excited about the potential of end user computing, particularly personal computers. At the same time, some are concerned about the possibility of waste created by functional managers making their first equipment and software decisions. It could also occur for the variety of other reasons mentioned in this report. Agency managers feel the need to take appropriate action. Because the technology is new and undergoing rapid change, however, the nature of this action is unclear. In addition, the various managers often have conflicting views on what action should be taken.

The need for a balanced environment to take into account the perspectives of end users, oversight, ADP, telecommunications, and records managers is obvious to all concerned. Agency executives must find a middle ground between the direction of management and the natural laissez-faire tendencies of an emerging technology.

Listed below are a series of recommended actions for the consideration of agencies. These actions recognize that a specific prescription for managing end user computing will evolve only when the technology has matured.

Establish a General Policy

Executives have three choices. Their policies can either force or constrain the new technology. Alternatively, they can establish an agency policy that permits the technology to find its own level based upon user needs and the availability of funds.

Forcing the technology can be advantageous because it holds the promise that an agency will be in an advanced technical position which could lead to early productivity gains. However, it is also a high risk role because not all the early promise of this technology will materialize as planned by manufacturers.

Constraining the technology ensures that agency resources will not be wasted until all aspects of the technology are proven. In effect, a constraining policy is akin to a moratorium. However, there is a disadvantage in that an agency does not function in lockstep with the emergence of technology. When the technology is finally proven, a huge effort is required to enable an agency to catch up in one series of actions.

Alternatively, management can adopt a neutral policy that is neither forcing nor constraining. This seems more appropriate in end user computing, particularly in the volatile marketplace of personal computers.

Develop a Strategic Plan

Executives have two choices with regard to planning. They can focus either on strategic level or on acquisition level plans. At the strategic level, executives think through where the technology can be used to make an impact in an agency. Where, for example, can the technology be used to raise the agency's overall productivity level? At the acquisition level, executives focus on the procurement of individual devices.

Planning at the strategic level has the potential for high payoff; simultaneously, there are increased opportunities for waste. Planning at the acquisition level has the advantage of tight control over the technology; as a result, there are minimal opportunities for waste. But,

tight control may eliminate empirical, imaginative ideas with the potential for major payoff. Also, executives addressing the acquisition process probably will not see the big picture and will miss major opportunities to improve productivity in their agencies.

Develop Agencywide Data Rules.

The decentralization resulting from end user computing means that more people will begin to create and have access to computer-based data than ever before. Agency executives will need to establish policy concerning data in a number of areas.

Data rules identify systems that are "corporate reserved" and restricted from usage by lower levels in an organization. Personnel and accounting systems are examples of "reserved" systems. Agencies will need to develop rules on personal, secure, general-purpose, or special interest data.

Data rules should be based on an "ownership" concept, in which the owner of the data is identified. The responsibilities and rights of an owner also need to be outlined. Agencies should develop rules on sharing, accessioning and updating data and on assigning authority to handle data. Agencies should have developed these rules long ago, but there was no sense of urgency when everything was controlled by the central ADP group. With the current state of fragmentation, however, agency executives will be under pressure to ensure that agencywide data strategies are developed.

Evaluate the Need for an End User Communications Network

Many end user computers will eventually need access to a communications network. They will, in time, need to communicate with other end user devices or with a remote central computer. The implementation of networks, however, is a long leadtime item. Agencies may wish to begin now to project future network requirements. To develop these projections, an agency should determine who will communicate with whom, on what data, on what type of communications facilities, and using what devices.

Establish Standards to Ensure Compatibility

Agency executives may wish to ensure that available options concerning equipment, communications, and software standards are considered. Within specialized groups, for example, identical equipment may be warranted when based on Federal Procurement Regulations. Communications protocols should be mandated to permit communications within and between these groups.

In software, a specific operating system and specific applications software may be mandated to facilitate sharing within a group. In addition, an agency may wish to emphasize that packaged software rather than hand-tailored programs will be used by end users.

Establish an Evaluation Program

An end user technology program can include three types of evaluations.

. Support Structure Evaluation. The support structure, described earlier in this paper, will provide an agency with great insight into all end user technology activities. Since this group provides a variety of services to the entire community, support structures will have an across-the-board awareness of progress within an organization. As a result, the support structure will be in a position to prepare an annual evaluation report.

. Stand-alone User Evaluations. Personnel who work independently on unstructured problems could be required to develop a brief, periodic annual report emphasizing the following items:

a. Accomplishments
b. Methods Used
c. Problems Encountered

In addition, a small sample of users in this category should be invited to periodically discuss their project with agency executives. The main objective would be to provide a learning experience for these executives.

. Complex Evaluations. Some end user applications will be complex and costly. The problems, effects, and results of the systems are highly visible. Problems will be easily recognizable and should receive the same scrutiny as other large information systems in agencies.

Develop Concise Justification Procedures

Each agency has developed elaborate procedures for the justification of ADP resources. These are often appropriate for proposed expenditures in the multimillion dollar range. For end user expenditures in the $1,000-$8,000 range, abbreviated justification procedures are more appropriate.

Agencies may need two sets of justification procedures. When one or a small number of end user devices, such as personal computers, are being requested, a one-page justification may be appropriate. Such a justification would be based on four items:

. A statement of the problem.

. The approach to the problem and the proposed packaged software.

. The expected benefits in terms of productivity improvements, value added to the process, or other improvements.

. A determination of how to monitor performance. Identification of data to track performance.

For expensive end user acquisitions and proposed complex systems, however, agencies should use already existing, justification procedures.

Establish a Review and Approval Process

Agency executives need to set thresholds indicating the authorities available at each level of management. There are two fundamental choices. At one extreme, line managers could be provided with the maximum authority to make independent decisions. At the other extreme, under the Paperwork Reduction Act of 1980, the information resources management official designated by an agency could be required to approve all end user technology decisions.

While the latter option may be required in certain agencies, it could be restrictive and burdensome in the high volume, low-cost world of end user computing. Another approach would be to use the existing budget process as the principle vehicle for approving expenditures. Agency procedures that govern the acquisition of any commodity could also be used to govern the review and approval of end user technology requests. As far as signoffs are concerned, adequate oversight could be provided by the separate approval of two levels of management above the requesting office.

These controls will be adequate for users who operate in a stand-alone, independent mode. These types of users need less central oversight.

Certain activities in agencies, however, will require more central oversight. Corporate reserved systems, such as accounting and personnel, and proposals that involve access to a telecommunications network or that are linked to other systems require central oversight and approval.

Identify the Classes of Users and Uses

Professionals, such as managers, scientists, and analysts, will use end user technology, particularly personal computers, in an unstructured way, often in a stand-alone mode of operation. On the other hand, clerical and administrative personnel will often use it in a

structured manner, perhaps linked to a network tied to other small users and often to a larger central computer. Stand-alone, unstructured uses require less central oversight and approval. Structured applications linked to a network such as electronic mail will require more extensive planning. These classes of users and uses need to be identified, in order to provide a basis for other executive management actions.

Encourage the Formation of Special Interest Groups

Special interest groups or specialists employ the same ideas, data, or tools. One example can be seen in utilization of software by an agency's budget analysts. Another example would be the 350 building managers employed nationwide by GSA's Public Buildings Service. Auditors and lawyers could be considered as separate categories of specialists.

Establishing a group of common users promotes the sharing of new ideas, developments, and solutions to problems. Equipment and software standards may be developed to facilitate the sharing of software between members of the group.

Many choices are available for agency executives who decide to promote the special interest concept. The central question is what authority each group will be given vis-a-vis line management. One current view is that they should be given the authority to develop their own ground rules and meet their specific needs. The exception would be when corporate reserved systems, data, or networks are involved.

Establish Support Structures

There is really no choice but to provide assistance for novice end users. Support structures need to be established in every agency. Such groups should not have approval authority over end users, but should function as service groups to help end users by performing the following tasks:

. Help new users get started.

. Provide advice on equipment, software, local networks, and techniques.

. Establish local area network standards.

. Provide a software clearinghouse.

. Provide a hotline number to solve problems encountered by end users.

. Provide educational tools to improve end user computing literacy throughout the agency.

Develop a Personal Computer Literacy Plan

The number of government personnel who will need to know about computers will grow rapidly in the 1980s. Agency executives have two choices. They can permit this large mass of people to obtain the knowledge they will need on an ad hoc basis. Alternatively, an agency wide computer literacy plan can be developed. While the initial cost estimates of the latter approach may be intimidating, they could, in turn, lead to the identification of more cost-effective alternatives.

The 12 actions recommended for implementation in agencies are summarized in Table 7, p. 29.

TABLE 7

MANAGED INNOVATION PROGRAM
AGENCY INITIATIVES

Purpose	Initiative
Policy/Planning	Establish a general policy
	Develop a strategic plan
	Develop agency wide data rules
	Evaluate the need for an end user communications network
	Establish standards to ensure compatibility
Review Process	Establish an evaluation program
	Develop concise justification procedures
	Establish a review and approval process
User Assistance	Identify the classes of users and uses
	Encourage the formation of special interest groups
	Establish support structures
Education	Develop a personal computer literacy plan

Chapter VI
Conclusion

Within the Federal Government, end user computing will require agency expenditures of several billion dollars during the remainder of the 1980s. Potential savings through productivity and other improvements will be much greater. End user computing represents a new, complex field encompassing many technologies, including word processing, personal computers, micrographics, local networks, and others. It involves stand-alone and integrated uses of the new technologies and concerns different classes of users, such as clerical, administrative, and professional personnel.

There are no generally accepted models for managing this technological diversity. The technology is too recent in design and too unpredictable in innovation to permit valid forecasts. The present need is to find a balance between managing the entire field and allowing the technology to evolve naturally within each agency.

At the present time, we observe several trends in this new field. Some managers view the potential of end user computing with an almost naive enthusiasm, while other emphasize the potential for waste. Some observers favor uncontrolled utilization of the new technologies in the government, whereas others counsel tight control and even a moratorium.

We at GSA have a midrange viewpoint concerning the management of end user computing, in which we recognize the need to strike a balance between these opposing viewpoints. We must develop timely policies and avoid premature, restrictive policies. To meet this need, GSA has developed a "managed innovation" program, with the assistance of selected agency personnel.

Under this program, GSA has been reviewing current agency regulations and guidelines to ensure that they are suitable for the emerging technology. In addition, several tools will be developed to assist agencies in procuring needed products at favorable prices and in a timely manner. Specifically these tools include a buyer's guide for equipment and software, a simplified road map through the regulations, and new procurement vehicles for equipment, software, and maintenance.

A new vehicle for improving government-wide literacy in end user computing will be evaluated. GSA will also work on a variety of initiatives with executives and line managers in federal agencies. These initiatives are designed to help develop a consensus on the proper ways to manage the emerging technologies.

The "managed innovation" program contains a series of recommended actions for agency executives. In planning, recognition of high payoff areas to improve productivity is preferred over identification of equipment to be procured.

Agencies should begin to develop appropriate processes for managing end user computing, particularly personal computers. These areas include justification, review and approval, and evaluation processes, which should be appropriate in the high volume low-cost world of end user computing.

Agencies should also begin to identify prospective classes of uses and users. Formation of compatible special interest groups should be encouraged and appropriate support structures should be established to assist novice users.

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Agencywide standards for equipment and software should be considered, while recognizing that procurement regulations already exist to facilitate competitive acquisitions. Agencies need to establish preliminary rules governing the use of data which is central to their mission. In most circumstances, end users will not be permitted to develop systems and manipulate data in any area they wish. Certain systems and data are "corporate reserved" and these restricted areas should be identified at an early date.

Finally, agency executives may wish to consider how to meet the massive training requirements that will result with the emergence of end user computing. An overall, long term training plan provides management with more options than an ad hoc plan which develops as the need arises.

As end user technologies emerge and as we learn more about how to manage them, we will initiate other actions in response to changing circumstances. Agency advice and counsel will continue to provide the basis for any GSA action in the field of end user computing.

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